MONTHLY NOTICES

OF THE

ROYAL ASTRONOMICAL SOCIETY.

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H. F. NEWALL, Esq., M.A., F.R.S., PRESIDENT, in the Chair.

Captain Richard Algernon Craigie Daunt, D.S.O., Lynalta, Newtownards, Co. Down, Ireland,
and
Edgar Odell Lovett, Ph.D., Professor of Astronomy, Princeton University, New Jersey, U.S.A.,

were balloted for and duly elected Fellows of the Society.

The following candidates were proposed for election as Fellows of the Society, the names of the proposers from personal knowledge being appended:—

Warin Foster Bushell, The Hermitage, Harrow (proposed by Col. G. L. Tupman);
Charles P. Butler, A.R.C.Sc., F.R.P.S., Solar Physics Observatory, South Kensington, S.W. (proposed by William J. S. Lockyer);
William Doberck, Ph.D., late Director, Hong Kong Observatory, Kowloon, Elgin Road, Sutton, Surrey (proposed by Sir W. H. M. Christie);
James Nangle, Technical College, Sydney, N.S. Wales, Australia, and Private Observatory, Tupper Street, Stanmore, near Sydney (proposed by C. J. Merfield);
Charles W. Raffety, Wynnstay, Woodcote Valley Road, Purley, Surrey (proposed by Richard Kerr); and
Rev. T. J. Williams-Fisher, M.A., Rector of Norton, Atherstone (proposed by Rev. D. H. Sparling).

Seventy-one presents were announced as having been received since the last meeting, including amongst others:—Lieut. A. ff.

Garrett, The Jaipur Observatory and its builder, presented by the author; Greenwich Astrographic Catalogue, vol. ii., 16 charts of the Astrographic Chart of the heavens, and Observations of the planet Eros, 1900–1901, presented by the Royal Observatory, Greenwich; Professor E. S. Holden, Galileo, and other tracts, presented by the author; Oxford Astrographic Catalogue, vol. iv., presented by the University Observatory, Oxford; Pennsylvania University Publications, Catalogue of 648 double stars discovered by Professor Hough, presented by the University; three lantern slides of the Corona of 1908 January 3, taken by Professor Campbell, presented by the Lick Observatory.

An Empirical Law of Astronomical Refraction.

By H. H. Turner, D.Sc., F.R.S., Savilian Professor.

1. The following investigation was originally undertaken with the view of substituting a simple proof of the law of refraction for students who could not follow the more elaborate proof involving the differential equation. But it was a surprise to find how closely the observed refraction could be represented with so rough a supposition as that of three, or even two, homogeneous shells of atmosphere; and the question was suggested whether, in the present state of our knowledge, more elaborate hypotheses were really justified. If a rough supposition fits the facts, clearly it is no proof of the correctness of a more elaborate one that it also fits the facts.

2. Moreover, suspicion of the correctness of existing hypotheses was suggested from another direction. Meteorologists are finding that the temperature of the atmosphere does not follow a smooth gradient, as is generally assumed in refraction hypotheses: at a certain height a wholly unexpected state of things has been found to exist. According to M. Teisserenc de Bort there is above 10 or 12 km., an "isothermal layer" in which the temperature ceases to fall as we ascend; and the conditions are similar over parts of the world where the temperatures close to the surface differ widely. It is difficult to reconcile these results of observation with the hypotheses usually adopted in constructing tables of refraction.* It is, however, not intended to examine at present the consequences of taking M. Teisserenc de Bort's work into account;—merely to show that it may not be difficult to do so when we have fuller information, without, perhaps, dislocating existing refraction tables.

3. First let us consider an atmosphere of one homogeneous spherical layer. Let C be the Earth's centre; OM a section of its surface through C and the star; LB the section of the boundary of

* I am indebted to Mr. Saunder for a reference to a paper by Professor Bakhuyzen in *Konink. Akad. van Weten. te Amsterdam*, 1907 January 26; see *Nature*, 1907 April 4, p. 538; in which the discordance between observation and the assumption usually made is demonstrated by a concrete example.